REMARKS/ARGUMENTS

The Office Action mailed October 20, 2006 has been received and reviewed. Claims 31 through 38 and 40 through 48 are currently pending in the application. Claims 31 through 33 and 40 through 48 stand rejected. Claims 34 through 38 have been objected to as being dependent upon rejected base claims, but the indication of allowable subject matter in such claims is noted with appreciation. Applicants have amended claims 31, 32, 34, 40, and 45 and added new claims 49 and 50. Reconsideration is respectfully requested.

Claim Objections

Claims 31 and 32 are object to because of informalities. Appropriate corrections have been made. Reconsideration and withdrawal of the rejection is requested.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on Applicants' Admitted Prior Art

Claims 31 through 33, 40 and 45 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Applicants' admitted prior art. Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Applicants respectfully submit that the prior art does not describe, either expressly or inherently, every element of the presently claimed invention. Claim 31 of the presently claimed invention recites a "method of reducing oxidation of an electrically conductive material, comprising: forming a first dielectric layer on a semiconductor structure, the first dielectric layer comprising a depression therein; filling the depression with an unoxidized electrically conductive material; reacting a chemical composition with an upper surface of the electrically conductive material to protect the upper surface from oxidation and to form a chemical compound more

resistant to oxidation than the electrically conductive material; and forming a second dielectric layer over the electrically conductive material and the first dielectric layer and adhering the second dielectric layer to the electrically conductive material, wherein reacting ~~a chemical~~ the chemical composition and forming ~~a second~~ the second dielectric layer occur simultaneously." Support for the amendments may be found throughout the as-filed specification including, for example, page 10, lines 20-22.

Applicant respectfully submits that the prior art does not describe either expressly or inherently, "reacting a chemical composition with an upper surface of the electrically conductive material to protect the upper surface from oxidation and to form a chemical compound more resistant to oxidation than the electrically conductive material" as recited in claim 31 of the presently claimed invention. Instead, a problem in the prior art was that the upper surface of the electrically conductive material would oxidize. (Specification, page 3, lines 12-25). This problem is overcome by the present application. As the prior art does not describe either expressly or inherently every element of the presently claimed invention, claim 31 is allowable.

Claims 32-33 are both allowable at least as depending from allowable claim 31.

Independent claims 40 and 45 avoid the prior art for at least the same reasons as stated for claim 31. Claim 40 of the presently claimed invention recites "adsorbing a chemical composition onto an upper surface of the electrically conductive material to passivate the upper surface and to form a chemical compound more resistant to oxidation than the electrically conductive material" and Claim 45 of the presently claimed invention recites "reacting a chemical composition with at least one monolayer of an upper surface of an unoxidized electrically conductive material to form a passivation layer." As stated, the prior art fails to describe, either expressly or inherently, this element. Accordingly, claims 40 and 45 of the presently claimed invention are allowable. Reconsideration and withdrawal of the rejection is requested.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,780,908 to Sekiguchi et al.

Claims 40 through 44 and 45 through 48 rejected under 35 U.S.C. § 103(a) as being unpatentable over Sekiguchi et al. (U.S. Patent No. 5,780,908) in view of Liao (U.S. Patent No. 6,114,238). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Sekiguchi discloses a method of forming a bilayer metal interconnect having a tungsten nitride barrier in a semiconductor apparatus. Metal is deposited in a via and, after the formation of the tungsten nitride barrier layer, an aluminum alloy layer is deposited thereover. (Abstract). The formation of the barrier layer prevents the formation of a tungsten-aluminum alloy which has a high resistance which is undesirable for an interconnection. (Sekiguchi, col. 3, lines 26-30). Liao discloses a self-aligned metal nitride for copper passivation. A metal plug 104 is deposited in a hole in a dielectric layer 102. Prior art methods included depositing a second dielectric layer 108 over the metal plug 104. However, this lead to reliability problems. (Liao, col. 1, line 34-39). Therefore, Liao discloses a second metal layer 212a over the metal plug 208 before further processing. The second metal layer 212a functions as a barrier layer. (Liao, col. 1, lines 41-45). Applicants respectfully submit that the proposed combination of references fails to teach or suggest every element of the presently claimed invention.

By way of contrast with the cited references, claim 40 of the presently claimed invention recites a " method of reducing oxidation of an electrically conductive material, comprising: forming a dielectric layer on a semiconductor structure, the dielectric layer comprising a depression therein; filling the depression with an unoxidized electrically conductive material;

adsorbing a chemical composition onto an upper surface of the electrically conductive material to passivate the upper surface and to form a chemical compound more resistant to oxidation than the electrically conductive material; and forming a second dielectric layer over the electrically conductive material and the first dielectric layer and adhering the second dielectric layer to the electrically conductive material such that the second dielectric layer substantially absorbs the chemical compound." Support for the amendments may be found throughout the as-filed specification including, for example, page 10, lines 20-22 and page 12, line 25 through page 13, line 1. Applicants respectfully submit that the proposed combination of references fail to teach or suggest every element of the presently claimed invention.

Specifically, the proposed combination fails to teach or suggest "forming a second dielectric layer over the electrically conductive material and the first dielectric layer and adhering the second dielectric layer to the electrically conductive material such that the second dielectric layer substantially absorbs the chemical compound." The cited art lacks any teaching or suggestion "that the second dielectric layer substantially absorbs the chemical compound" as recited in claim 40 of the presently claimed invention.

Additionally, no motivation exists to combine the references to teach all of the limitations of claim 40 of the presently claimed invention. Sekiguchi discloses an aluminum alloy is adhered to the tungsten plug. The Examiner relies upon Liao for teaching "forming a second dielectric layer over the electrically conductive material and the first dielectric layer and adhering the second dielectric layer to the electrically conductive material." In order to adhere a "second dielectric layer to the electrically conductive material," the second interconnect 8a, 8b (i.e, the second metal layer of the bimetal layer) of the Sekiguchi apparatus would need to be eliminated. No motivation exists within Sekiguchi or Liao for such a modification. As the proposed combination fails to teach or suggest every element of the presently claimed invention, claim 40 cannot be rendered obvious by Sekiguchi in view of Liao. Accordingly, claim 40 is allowable.

Claims 41 through 44 are each allowable as depending, either directly or indirectly, from allowable claim 40.

Independent claim 45 is allowable at least for the same reasons stated for independent claim 40. Independent claim 45 includes the similar recitation of "reacting a chemical composition with at least one monolayer of an upper surface of an unoxidized electrically conductive material to form a passivation layer; and adhering a dielectric layer to the electrically conductive material such that the passivation layer is substantially absorbed by the dielectric layer." As stated, Sekiguchi in view of Liao fails to teach or suggest these elements. Accordingly, claim 45 of the presently claimed invention is allowable.

Claims and 46 through 48 are each allowable as depending, either directly or indirectly, from allowable claim 45.

Objections to Claims 34 through 38/Allowable Subject Matter

Claims 34 through 38 stand objected to as being dependent upon rejected base claims, but are indicated to contain allowable subject matter and would be allowable if placed in appropriate independent form. Applicants have amended claim 34 to be in independent form and submit claim 34 is in condition for allowance. Specifically, claim 34 now includes each of the elements of claim 1 (prior to the current amendments) and also recites "reacting a nitrogen-containing composition with the upper surface of the electrically conductive material." New claims 49 and 50 depend from claim 34 and are substantially similar to claims 32 and 33 respectively. No new matter is added.

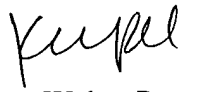
ENTRY OF AMENDMENTS

The amendments to the claims above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 31 through 38 and 40 through 50 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,



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In accordance with 37 C.F.R. § 1.97(g) and (h), filing of this Supplemental Information Disclosure Statement is not to be construed as a representation that a search has been made or an admission that the information cited herein is, or is considered to be, material to patentability as defined in 37 C.F.R. § 1.56(b). Further, no representation is made by Applicants herein that no other possible material information as defined in 37 C.F.R. § 1.56 (b) exists.

Other Documents

HOUGEN et al., "Chapter 10: Adsorption," Chemical Process Principles, Second Edition, John Wiley and Sons, Inc. (1954), pp. 368-393.

Applicants offer to supply any explanation or discussion of the document which the Examiner feels is necessary or desirable and which is requested.

This Supplemental Information Disclosure Statement is filed after the mailing date of the first Office Action on the merits.

The fee pursuant to 37 C.F.R. § 1.17(p) is enclosed.

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Enclosures: Form PTO/SB/08B (1 page)
Cited Non-U.S. Patent Document
Check No. 10674 in the amount of $180.00

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